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United States Department of Agriculture
Animal and Plant Health Inspection Service
Program Aid
Number 1541

Biological Control Programs

Plant Protection Laboratories

aSB975
.5
U6B56
1995



Benefits of Biological Control



Biological control has moved to the forefront of viable technologies for controlling pests. This technology involves the use of pest species' live natural enemies ("biological control agents") to reduce pest populations. By reducing or eliminating the need for pesticide applications, biological control programs help to improve food safety, protect biodiversity, enhance water quality, and preserve the overall environment.

Farmers and ranchers achieve significant savings in labor, pesticides, and equipment from applying biological control. For example, as a result of a biological control program for the alfalfa weevil, farmers in 11 Northeastern States reduced pesticide use by 73 percent between 1959 and 1979 (Day 1981). Alfalfa farmers continue to save \$88 million a year (measured in 1987 dollars), resulting in a benefit-cost ratio of 87:1.

Above photo: Adult flea beetle *Aphthona nigriscutis* on leafy spurge foliage. Female flea beetles lay up to 250 eggs that hatch into larvae which feed on leafy spurge roots. This feeding disrupts the plant's vascular tissues and accounts for the major impact of this insect on leafy spurge. (APHIS photo by Robert D. Richard.)

Cover photo: *Chilocorus kuwanae* is a major predator of euonymus scale, an insect pest that damages many species of the shrub popularly known as burning bush. (Agricultural Research Service photo by Tim McCabe.)

Biological Control Philosophy

The U.S. Department of Agriculture's (USDA) Animal and Plant Health Inspection Service (APHIS) believes that modern biological control, appropriately applied and monitored, is an environmentally safe and desirable way to manage pest species over the long term. Biological control is not a solution to all pest problems and has limited application in emergency eradication programs. However, APHIS believes that biological control is preferable to chemical control when applicable and should become the base strategy for integrated pest management wherever possible.



Parasitic wasps such as *Diaeretiella rapae* keep Russian wheat aphid populations from reaching damaging levels on small grains and many other crops. (Photo courtesy of Jack Kelly Clark, University of California Statewide IPM Project.)

Plant Protection Laboratories

In the early 1980's, the APHIS Plant Protection and Quarantine (PPQ) program implemented biological control projects for agricultural pests. Today, the USDA-APHIS-PPQ Plant Protection Laboratories develop and implement biological control projects in cooperation with other organizations.

Mission: To implement biological control technologies in a cooperative effort with Federal and State agencies to control pests of economic importance.

Principal Objective: To mass-produce and release native and exotic natural enemies for control of agricultural pests, including insects, mites, and weeds.

Principal Approach: To take actions that involve the importation, quarantine screening, rearing, establishment and augmentative releases, redistribution, and evaluation of natural enemies of pest species.



Alfalfa weevils cause significant damage to alfalfa nationwide. The parasite *Microctonus colesi* is shown here with alfalfa weevil larvae. (APHIS photo by Laurie Smith.)

Project Selection Criteria

In determining the feasibility of using biological control for a certain plant pest, PPQ considers many factors. These include

- The degree of interest and support from States and other cooperators,
- The geographical distribution of the pest,
- The origin of the targeted pest species—native or exotic,
- The status of known biological control technologies,
- The availability of alternative control measures,
- The probability and degree of success, and
- The resources required and available.



An APHIS laboratory technician counts laboratory-reared natural enemies for subsequent release. (APHIS photo by Laurie Smith.)

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Cooperators

PPQ relies heavily on the following cooperators to implement successful biological control programs: State departments of agriculture; USDA's Agricultural Research Service, Cooperative State Research, Education, and Extension Service, and Forest Service; the USDA-APHIS National Biological Control Institute; and farm industries.

Projects

PPQ personnel have managed several successful suppression programs to completion, and 13 projects are ongoing.

Completed:

Insects

- Alfalfa weevil (1980–91)
- Cereal leaf beetle—Eastern United States (1966–79)
- Citrus whitefly (1981–85)
- European corn borer (1986–94)
- Mexican bean beetle (1980–84)

Weeds

- Silver leaf nightshade (1982–86)

Ongoing:

Insects

- Boll weevil
- Brown citrus aphid
- Cereal leaf beetle—Western United States
- Colorado potato beetle
- Euonymus scale
- Gypsy moth
- Pine shoot beetle
- Russian wheat aphid
- Sweetpotato whitefly

Weeds

- Common crupina
- Diffuse and spotted knapweeds
- Leafy spurge
- Purple loosestrife

For More Information

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APHIS has produced a series of color brochures on biological control projects. To request a free copy of the brochures listed below, contact the APHIS Management Services Division by calling (301) 734-4478 or by telefaxing (301) 734-8455. Please cite the Program Aid number (in parentheses) following the title.

- Mexican Bean Beetle: Its Control With Parasites (1285)
- Biological Control: Spreading the Benefits (1395)
- Biological Control of the Alfalfa Weevil (1321)
- Biological Control of Leafy Spurge (1435)
- Biological Control of the Russian Wheat Aphid (1507)
- Biological Control of Euonymus Scale (1508)
- Biological Control of Spotted and Diffuse Knapweeds (1529)



Putting parasites into nylon mesh cages helps guarantee initial establishment of parasites in the field. (APHIS photo by Laurie Smith.)

Day, W. H. 1981. Biological control of the alfalfa weevil in the Northeastern United States. In: Papavizas, G. C., ed. Biological control in crop production. Totowa, NJ: Allenheld, Osmum: 361-374.



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